GEODE REPORT

Bringing Intelligence to the Grids

GEODE Working Group Smart Grids

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The Voice of local Energy Distributors across Europe

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Executive Summary

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In the coming decades the way we generate and consume energy will change and critical parts of our energy future will be decided. With increasing demand and a greater use of renewables; ensuring security of supply and affordably for consumers, will be an increasing challenge. Crucial for delivering this major shift in our approach to energy will be the development of smart grids that can enable low carbon technologies and utilise innovative techniques and equipment to make the networks more efficient and cost effective.

Many of the improvements to create smart grids will take shape within the distribution networks and, as the voice of local energy distributors across Europe, **GEODE** has produced this paper to set out the position of these Distribution System Operators (DSOs) to look at the management of intelligent electricity grids and what can be done to support their deployment.

There are numerous benefits to adopting smart grids, especially to enable the transition to flexible use of micro generation and large scale renewables while maintaining a reliable network. However, consumers will be at the heart of success in tackling this challenge and their own awareness and engagement in their energy future is vital. Therefore, the integration of smart meters, the effective use of consumption data from them as well as clear advice and well articulated tangible benefits will be essential. For this we need governments to aid in the engagement of consumers so that an open market is possible and everyone is able to actively participate in it.

Innovation is going to be a significant part of the development of smart grids, but in a regulated environment incentives are necessary to empower DSOs and provide the right mechanisms for these developments. From my own experience in the UK the unique Low Carbon Networks Fund, provided by our regulator Ofgem, has helped our DSOs to pioneer new grid technologies, explore different ways of working and allowed more flexible commercial arrangements in an effort to draw out the very best in engineering and business practice.

However, one size does not fit all and so across Europe it is essential that the steps taken to support smart grid developments must be suitable for each Member State individually. A pan-European approach and legal mandates risk being over-prescriptive and rather than supporting and invigorating progress it could have the opposite effect. European legislation should not inhibit national solutions where they are cost effective and capable of delivering success.

While smart grids will be instrumental in meeting the challenges of our energy future, conventional network reinforcement will remain necessary and here too, governments have a role to play in incentivising the investment required to ensure extra capacity is built. Meanwhile DSOs should also continue their traditional role of being the primary point of contact for customers where new connections and outages are concerned.

DSOs are absolutely critical to meeting the energy challenges of the future and this report sets out GEODE and its members' position on the direction of travel we need. The move towards smart grids marks the development of the DSOs role, one that forges a new and innovative path that consumers can actively engage in. With the need for new technologies to work alongside traditional infrastructure, it is right that the DSOs themselves are given the opportunities to collaborate with partners from other sectors without having this potential undermined by sweeping mandates. This collaboration is a necessary enhancement of the DSO role that is mutually beneficial to consumers and industry.

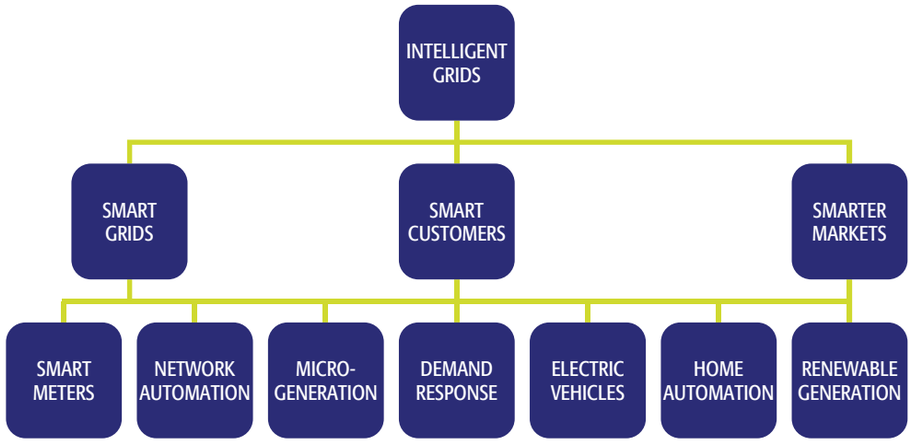
Finally GEODE would like to give some key recommendations for actions to be taken by the European Commission and regulatory bodies to help Smart Grids deployment become a reality.

Smart DSOs play a key role in the intelligent grid

A new smart electricity market is about to become a reality in Europe. The Smart Grid is a hot topic usually associated with the Smart Meter the most noticeable component of this concept. However, of more importance than the meter itself is the handling and exchange of information the Smart Meter is able to provide.

The intelligent grid is a term used to encompass all of the emerging technologies and techniques which will enable Europe to meet its ambitions for low carbon, sustainable, secure and economic electricity generation and supply.

Below is a diagrammatic representation of this concept, although the items listed are by no means exhaustive and their relationships to one another are likely not as conveniently coherent as presented here.



Source: GEODE

The DSOs have, in most of EU countries, a key role in the deployment of Smart Grids and Smart Metering systems as well as in handling Smart Metering data.

SMART GRIDS

Bringing intelligence to the distribution grid is essential as most smart grid features will be implemented at the local distribution level. For instance, PV and other renewable distributed generation, electric vehicles and demand response will largely be connected to the distribution grids (e.g. more than 90% of the renewable generation is connected to the distribution network in Germany).

The Smart Grid will employ innovative products and services together with intelligent monitoring, control, communication, automation and self-healing technologies. Smart Grids will better facilitate:

- Customers playing a role in the optimisation of the operation of the electricity system.
- The provision to customers of greater information and options for choice of supply.
- The connection of renewable generation to the distribution grid.
- The maintenance and improvement the existing high levels of system reliability, quality and security of supply.
- A significant reduction in the environmental impact of the whole electricity supply system.

Smart Grids will benefit all market actors and the energy system as a whole. Nevertheless, **the DSOs face the biggest challenges to make Smart Grids a reality,** such as:

- Management and operation of the local grid with increased intelligence and increasing volumes of data to be handled.
- Increased levels of distributed generation, active management of demand, local storage and electric vehicles (EV) will impact the distribution grid.
- Ensuring data privacy and system security.
- The DSOs, together with the regulators and other market actors will have to participate in the development of rules for Demand Side Response.
- DSOs will have to make significant investments in new "smart" technology and ICT infrastructure.
- Whilst investing in smart technology, the DSOs will have to maintain and reinvest in the conventional grid (transformers, cables, overhead lines) which will continue to be the backbone of the networks of the future.

- **Smart Grids will benefit all market actors and the energy system as a whole.**
- **Smart Grids will mostly affect the local and regional distribution grids. These grids have to be able to handle increased amount of fluctuating distributed generation, and increased amount of data handling, while ensuring system security, data privacy and demand response.**
- **DSOs will face huge investments in ICT and smart technology while at the same time maintaining and investing in the conventional grid components.**

SMART METERS

Roll out of Smart Meters

The Smart Meter is a key feature of the Smart Grid, bringing not only customer consumption information to the customer and the market actors for billing purposes, but also enabling the DSO to operate the grid more efficiently.

The Electricity Directive (Directive 2009/72/EC) mandates the installation of Smart Meters for at least 80% of customers by 2020, subject to an economic assessment of all the long-term costs and benefits to the market and the individual consumer.[1]

The deployment of Smart Meters in Europe is the most obvious development of the Smart Grid in the near future. To date several Member States have already taken the decision to roll out electricity smart meters. This is the case in UK, Ireland, Sweden, Finland, the Netherlands, France, Spain, Italy, Austria, Slovenia and Estonia. Following a cost-benefit analysis (CBA) with negative results Belgium and Czech Republic have decided not to carry out a Smart Meter roll-out. Some other countries, for example Germany have not yet taken a decision.

In all Member States in the EU (except the UK and Germany) the DSO is responsible for Smart Metering deployment and operation. In the UK is the suppliers' obligation to roll out Smart Meters and in Germany metering is handled by independent meter operators.

Replacing Europe's old mechanical meters with smart ones is a huge undertaking which will require substantial investment from the DSOs.

GEODE wants to emphasise that smart metering is much more than a simple change of meters. The roll out of smart metering systems requires investments in non standardized smart metering technology, concentrators and ICT, has an impact on many of the DSOs' business processes, and requires upgrades or replacement of existing IT systems to cope with the expected data volumes.

The DSO (or meter operator) must also ensure that the smart metering infrastructure is secure. This will require constant upgrading and investments in order to match the pace of technological development in this field.

[1] Directive 2009/72/EC concerning common rules for the internal market in electricity, Annex I,2

GEODE recommends that **the DSO should retain responsibility for metering as the meter is the logical end point of the DSOs' electrical grid.** As a regulated entity, the DSO provides market stability and is the only market actor that always has a connection to the customer.

The DSO also needs the information provided by the meter to operate the grid most effectively. Therefore in order to utilize many of the benefits that a Smart Meter provides, such as increased knowledge of quality of delivery, increased information on low voltage network, reduce peaks in power demand and better information for investment planning, the DSOs is the natural responsible party for metering.

GEODE recommends the establishment of minimum common functionalities in all future smart meters and supports the Commission set of common functional requirements of the Smart Meter presented in their Recommendation of 9 of March 2012 on preparation for the roll-out of smart metering systems (2012/148/EU).

GEODE considers the basic minimum functionalities in smart metering systems to be the following:

- Record at least hourly consumption and production information (actual import and export values separately)
- Information collected on a daily basis and delivered to market actors with regulated duties
- Provide access (two way communication) from meter operator to information needed for maintenance and control
- Possibility to connect/disconnect site remotely (the DSO and/or Supplier)
- Outage information
- Load management
- Fraud prevention and detection
- Standard open interface for customer use.

When deciding on new requirements for smart meter functionality these should not apply retrospectively. Decision making bodies should take into account that changing standards and regulations regarding meter functionalities for already installed smart meters will carry a significant cost which will ultimately be borne by the consumer.

- The Smart Meter is a key feature of the Smart Grid, bringing not only consumption information to the customer, and the market actors for billing purposes, but also enabling the DSO to operate the grid more efficiently. A Smart Meter roll out is much more than a simple change of meters.
- The DSO is responsible for smart metering deployment and operation in all Member States in the EU except the UK and Germany.
- The DSO should retain responsibility for metering as the meter is the logical end point of the electrical grid.
- The DSO can utilize many of the benefits that a Smart Meter provides for efficient operation of the grid for the benefit of the customer and the whole energy system.
- Minimum common functionalities should be established for all future installed meters.
- New requirements in Smart Meter functionality should not apply retrospectively.

DSO and Meter Data Management

The Smart Meter is vital in order to realise the benefits of the Smart Grid and to operate the grid effectively and efficiently. All suitable market actors should be granted access to metering data in a secure and non-discriminatory way. This is guaranteed when the party responsible for metering is the DSO, a regulated neutral entity.

As previously noted, in most Member States, the DSO is responsible for metering as an integrated part of the grid. The DSO is the neutral market facilitator that ensures the reliability and stability of the system while facilitating the commercial activities of other market actors and above all safeguarding the interests of customers.

The customer is always the owner of their data. **It is important to realize that metering data belongs to the customer** themselves. The DSO is responsible for ensuring that customers' data is distributed only for regulated duties (e.g. billing). Any other data sharing must to be approved by the customer.

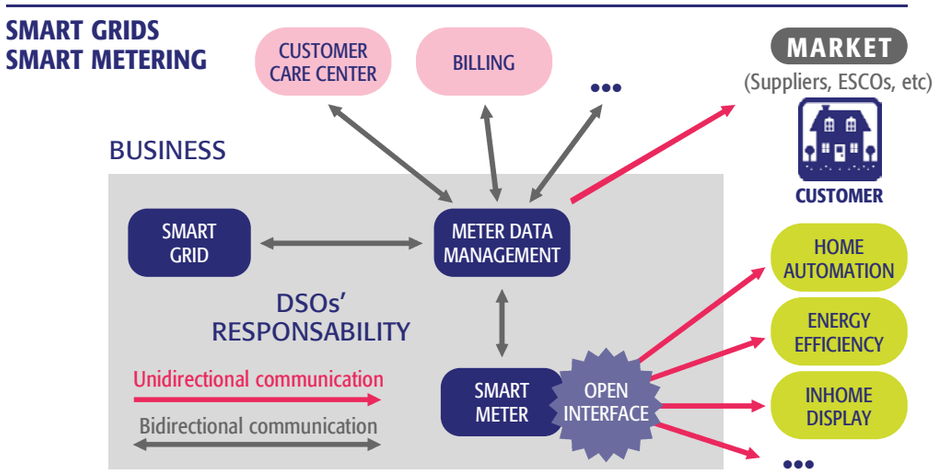
In addition to billing, there are other regulated duties that require information from the Smart Meters. These DSO duties that benefit the customer and the whole energy system can be for example maintaining security of supply, multiple grid operations and connection, handling of planned and unplanned interruptions, energy efficiency. In order for the DSO to operate the network effectively and efficiently and to maintain security of supply some Smart Meter data should be made available to DSOs as a matter of course.

While the customer may grant access to their data to other market actors, **it is essential that only the meter operator (in most countries the DSO) has direct access to and the ability to control the Smart Meters** – programming, collection of consumption data, connection/disconnection commands, etc. **Only in this way can the safety and security of the Smart Meters be guaranteed.**

The information DSOs collect from Smart Meters should be (with the permission of the customer) available to other market actors and based upon agreed message formats sent to the meter operator for actions to be executed. The **Smart Meter should be equipped with a standardized open interface** enabling the customer direct access to their consumption information. This could also enable access to consumption dta for their Supplier and/or ESCO of their choice for other purposes. These purposes can include for example energy displays, energy efficiency equipment and demand response solutions. A standardized open interface promotes competition between ESCOs and Suppliers on a non-discriminatory basis.[2]

The data exchange model for disseminating this data should be clearly defined and standardized. **Effective information exchange between the electricity market actors is crucial.**

Interoperability is the key to ensuring that all data captured by Smart Meters can be used effectively by the DSO, the Supplier and other market actors.



Source: GEODE

[2] For additional information see GEODE position paper on meter data management. January 2013 (to be downloaded at www.geode-eu.org)

- The DSO is the neutral market facilitator that ensures the reliability and stability of the system while facilitating the commercial activities of other market actors and above all safeguarding the interests of customers.
- The customer is always the owner of their data. The DSO is responsible for ensuring that customers' data is distributed only for regulated duties. Any other data sharing must be approved by the customer.
- To create further market opportunities, all Smart Meters should be equipped with a standardized open interface.
- The customer will have access to their consumption information via a standardized open interface in the Smart Meter.
- Meter data should be provided to other market actors authorised by the customer, using the aforementioned standardized open interface in the Smart Meter.
- This standardized open interface will enable the customer to use their consumption data as an input for energy efficiency investments such as control equipment, smart heat pumps, efficient ventilation etc.
- To enable the DSO to operate their network efficiently and to maintain security of supply, certain smart meter data should be made available to DSOs as a matter of course.
- For safety reasons, it is essential that only the meter operator (DSO or other) has direct access to and control of Smart Meters.
- The market needs a clearly defined, effective and standardised information exchange model.

Demand Response

Demand Response is a part of energy efficiency measures and can enable more effective integration of renewable generation into the energy system. Information from Smart Meters in combination with market information (such as energy prices) can enable the customer through their smart equipment to take actions that reduces pressure on the energy system at times when energy resources are in highest demand.

An important feature of the smart grid is the ability for electricity producers and customers to effectively change their electricity usage depending on the current energy supply and demand situation. A producer could start a generation facility when the energy price reaches a certain level and the customer could choose to activate energy storage facilities such as hot water accumulators when the price is low. Energy prices are expected to be more volatile in the future due to greater renewable generation capacity which will less readily adapt its' output to changes in demand.

The DSO, as the operator of the metering system, acts as an enabler of demand response functions for the market **by providing the physical infrastructure for the market and also by providing actual consumption information.**

Without Smart Meters that are able to measure electricity usage on an hourly basis, it will not be possible to deliver an effective price signals to the customer telling them to reduce or increase their consumption during particular periods.

The DSO has a keen interest in avoiding overload in the grid by ensuring that the average peak load is kept at an acceptable level. In order to achieve this, **the DSO must to be actively engaged in the operation of demand response functions.**

Below are a few examples of **how the DSO might use demand response functions in order to maintain grid stability:**

- Applying time-of-use grid tariffs.
- Operating storage facilities.
- Providing information to the market about expected peaks in the electricity usage.
- Enabling the connection of EV charging stations to the grid.
- Providing outage information from the smart meters.
- Connecting renewable generation to the grid.
- Connecting micro generation to the grid.

- Demand Response is a part of energy efficiency measures and can enable more effective integration of renewable generation into the energy system.
- The DSO as the operator of the metering system acts as an enabler of demand response functions on the market.
- The DSO must to be actively engaged in the operation of demand response functions to avoid overload in the grid by ensuring the peak load is kept at an acceptable level.

Benefits of bringing intelligence to the grids

Bringing intelligence to the electricity distribution grid is a prerequisite to meeting the EU 20/20/20 goals in 2020.

At the same time **GEODE** believes that in the future the European electricity supply system should incorporate the following principles to deliver enhanced benefits to the consumer, other market participants and the wider energy system.

Flexibility: To effectively integrate renewables and micro generation the grid must be flexible and able to accommodate both large scale wind generated power down to micro-generation whilst still meeting the requirements of consumers.

Accessibility: The grid of the future must also be accessible to all stakeholders, from large scale producers to micro producers as well as all consumers.

Affordability: For the grid to remain economical it must be operated and extended in an intelligent, efficient and effective way.

Reliability: The grid must continue to deliver high levels of reliability and stability.

BENEFITS TO THE CONSUMER

The future energy market will be influenced by fluctuations in supply and demand to a greater extent than it is today. In the long term it is the customer and more broadly society who will benefit from an effective and efficiently operated distribution network delivering their regulated duties.

Smart Meters, when combined with billing based on actual consumption or appropriate consumption feedback, increase customer awareness of how and when energy is consumed, providing better control over their consumption and enabling their more active participation in the energy market.

Already today the customer is in many cases also a part time producer of electricity, a so called “prosumer” in small or large scale installations and this will only increase in the future.

To aid consumers to use energy in the most efficient way possible (i.e. reduce/increase or alter their consumption patterns over time) there is a need to provide them with accurate information regarding their energy consumption and production and to give some incentives for making changes to their usage.

The most efficient way to provide customer with their consumption information is, as previously mentioned, through a standardized open interface in the Smart Meter itself. The Smart Meter can then provide additional functionalities such as offering the customer time-of-use tariffs and dynamic prices based on more frequent consumption measurements. The customer will then be able to choose to when to consume energy and benefit when the price is low. This could also be achieved through automation built into customers' smart appliances, thereby reducing the need for manual actions.

Consumers' active involvement in demand response will encourage them to adapt to new and smart consumption patterns, introducing flexibility to the way they consume electricity. New products for customer awareness are available, such as home displays, apps, controls etc. while new ones will develop.

BENEFITS TO OTHER MARKET PARTICIPANTS: SUPPLIERS, ESCOs, OTHERS

Market participants can rely on the neutrality of the DSO as a regulated entity, performing its regulated duties in an effective and efficient way, ensuring network stability at all times.

Intelligence in the grid is essential to ensure that all data provided by Smart Meters can be made available to suppliers, ESCOs and other market actors authorised by the customer in order that they can offer new and innovative products to them.

The supplier, based on their contract with the consumer (and/or prosumer), will need different types of information from the Smart Meter (e.g. to offer the customer advanced electricity products, the supplier needs daily consumption data on at least an hourly basis).

The information required by ESCOs will likely be complex. Some ESCOs may only use statistics for their business purposes while others will need to install active equipment at the customer's site to be able to control consumption (i.e. demand response management). In many cases, the ultimate users of this information are the customers themselves. They might change their behaviour or install new equipment based on advice from the ESCO and make use of the standardized open interface in the smart meter.

BENEFITS FOR THE ENERGY SYSTEM

The most important aspect of the Smart Grid, from a DSO perspective, is to facilitate effective demand response functions in order to as precisely as possible adjust local energy usage to locally available production to avoid overloading of the grid and reduce network losses. This is the key to a smart electricity market with a very high degree of distributed renewable energy sources as is foreseen.

An effective demand response function will result in lower energy system costs and reduced usage of fossil fuel based electricity production contributing to lower carbon output.

Benefits for energy efficiency

The deployment of Smart Meters –equipped with the standardised open interface– will allow the customer to implement energy efficiency measures (including demand response).

Smart Network control of voltage, power quality, etc

The increased operational information that will be available regarding the status of the DSOs network will allow for the quality of power delivery to be understood to a much larger degree than before. This includes information such as power failure alarms, statistics on power outages, voltage levels and power consumption and can potentially deliver savings in operating and managing the electrical grid. This increased knowledge will also allow the DSO to provide better customer service e.g. outage information to the customers via smart phone applications.

Benefits for Smart Network Planning

Deployment of metering in transformers creates an overview of losses in the grid and makes it possible to optimize cables and make better decisions when planning the grid. It will reduce the cost or make the cost of investments in the grid increase more slowly in comparison with conventional grid planning.

- Bringing intelligence to the electricity distribution grid is a prerequisite for meeting the EU 20/20/20 goals in 2020.
- Intelligent grids, effectively and efficiently operated will benefit consumers, market participants, society and the wider energy system.
- Consumers will benefit through using energy in the most efficient way possible with accurate information regarding their energy consumption and production and economic incentives to make changes to their usage patterns.
- The increased information on the network will allow DSO for better voltage control, quality of supply and efficient network planning to the benefit of the whole energy system.

Barriers to deployment of intelligent grids

GEODE identifies the following key barriers that exist for the deployment of intelligent infrastructure, smart grids, smart meters and other innovative technologies.

It is important that these barriers are addressed to allow the development of the future intelligent electricity market in a cost effective way.

CONSUMERS' ACCEPTANCE

GEODE believes that the main purpose of the smart electricity market is to create value for society and thus customer benefits. Through Smart Meters customers will have the possibility to play a more active role in the energy market and exploit it to their benefit.

Customers should be better informed of the advantages Smart Meters can bring to them to encourage their involvement in the future energy market.

Politicians and decision-makers at European, national, regional and local level have a role to play in helping to ensure customer acceptance of Smart Meters.

To facilitate customer engagement, Member States should retain the right to choose the market model that brings the most benefits to their region and customers based on historical traditions, technical development and current market structure, keeping costs of any changes as low as possible.

INCENTIVES FOR RESEARCH AND DEVELOPMENT, (R & D)

DSOs being responsible for the secure operation of the electricity system will need to lead the testing of new solutions through R & D projects. This is the way to evaluate and test the benefits of innovative intelligent technology, estimate costs, learn about customer behaviour and barriers to overcome and lay the foundation for possible further deployment.

As DSOs are essential in the deployment of Smart Grids it is necessary that all DSOs, small, medium and large, are able to participate in these R & D projects. Larger and more numerous R & D funding programmes than the currently exist are needed on a national and European level. Such **fundings should be accessible to all network operators regardless of their size.**

The R & D projects which are publicly funded should not only deliver benefits to society but also increase the level of knowledge and expertise within the industry as a whole as well as of all actors in the value chain.

An example of good regulation incentivising R&D work within the DSOs can be found in Great Britain (GB). In 2009 the GB energy regulator, Ofgem, announced the **Low Carbon Networks Fund (LCNF)** to help drive innovation and promote new technologies to deliver the intelligent grids of the future. The LCNF is one of the most significant investments in network innovation in Europe.

The LCNF provides up to £500 (€580) million over five years (2010 to 2015), encouraging and enabling a transition to a low carbon energy sector. This funding is broken down into the following elements:

The Second Tier Funding Mechanism provides total funding of up to £320m (€373) during the five years of the DPCR5 period for a small number of significant 'flagship' projects. A total of £64m (€75) may be awarded in a single year. These projects are likely to differ in their scope and value from First Tier LCNF Projects and consequently are subject to separate governance arrangements which are detailed in this section of the document.

Tier One of the LCNF provides £80m (€94) over five years. A total of £16m (€19) may be awarded in a single year. This First Tier is designed to enable DNOs to recover a proportion of expenditure incurred on small scale projects.

A Discretionary Funding Mechanism worth £100m (€117) over the five year period enables Ofgem to reward successful delivery and projects that bring particular value in helping the DNOs understand what investment, commercial arrangements and operating strategies they should be putting in place to provide security of supply at value for money for future network users, while doing all they can to tackle climate change.

PROPER INCENTIVES FOR INVESTMENTS

The Smart Grid as well as the role out of Smart Meters implies enormous investments for the DSOs. Initially, it is likely that the benefits will not match the costs for the investor. As benefits are shared along the value chain, including the end consumer, the cost has to be distributed as well.

Since the business of the DSO is regulated, **it is very important that the DSO is allowed by the regulator to finance these investments through grid tariffs or other revenue streams.**

Without proper incentives, the timely deployment of the Smart Grid will not happen. It is important that any incentives developed are long term based on a sustainable regulatory strategy.

In this context **regulatory authorities are the key facilitators of a smarter future** – they have to empower DSOs to take an active part in developing smart grid solutions. The development of an adequate framework at national level is essential to incentivize DSOs for Smart Grid and deploy smart meters integrating new and best technologies.
The demand for investments in smart grid technology happens to peak at the same time as the need for renewal of the conventional grid is greater than ever. Most of the conventional electricity grids in Europe were built in the post-war years and have now reached the age when they need to be replaced with modern conventional technology.

With rising demand for security of supply and an economy that suffers greatly from power outages of even a few seconds, **conventional grid investments must not be neglected** in the light of the Smart Grid. Unfortunately, today's regulation tends to focus in deploying the Smart Grid, forgetting the need to maintain the traditional grid infrastructure. In order to ensure both smart technology and at the same time maintaining grid quality, the European energy regulators should create incentives for investments in both types of grids.

Current incentive based regulation models used to set grid tariffs in most Member States focus on short term cost reductions, and give almost no incentives for innovation and investments for the future. In order to fully take advantage of the new technology related to the smart grid, **the regulatory models have to be updated.**

GEODE believes that the following criteria should be taken into account by Regulators when setting DSO grid tariffs:

- **Sustainability, future oriented and long run predictability:** is essential as the DSO business has a planning horizon of decades and the challenges are changing in line with the development of the energy policy of the EC to achieve the decarbonisation of the energy market.
- **Investment and innovation friendliness:**
  - To allow investments in technical equipment and ICT infrastructure enabling the implementation of intelligent solutions and to make the necessary reinvestments in the "conventional" components of the grids (transformers, cables).
  - To allow DSOs to strongly commit to R&D and demonstration projects to be part of the creation process of the electricity networks of the future in good time.

As DSOs are prime movers in the deployment of Smart Grids it is essential they are empowered by an adequate regulatory framework to take an active part in this deployment.

GRID TARIFFS

DSOs should have the option to offer more flexibility in designing the grid tariffs which is not the case in all EU countries. The increasing number of "prosumers" is a new challenge and therefore not foreseen in the current tariff schemes. **Distribution grid tariff structure does not reflect the cost of the grid.**

It is clear that Smart Grids will change the operational environment in electricity distribution. One consequence is that while the energy delivered to customers is reduced, at the same time the grid tariff (price per kWh) will increase in order for DSOs to be able to cover their fixed costs.

It is time to move to a cost reflective DSO grid tariff structure that provides customers with incentives to optimize their electricity usage based on the demands of the distribution network while enabling market based demand response and providing incentives for distributed generation and energy efficiency.

In **GEODE**'s view flexible grid tariffs using the opportunities and functionalities of smart metering systems are a possible tool for DSOs to cope with the future challenges. One possible model could be power based tariff that provides incentives to decrease the peak-power demand and achieve permanent energy savings.

GEODE agrees the Member States should have the freedom to choose an adequate grid tariff structure in accordance with local needs on the basis of the principle "one size does not fit all".

PROPER MARKET DESIGN

Without the proper market design, Smart Grids by themselves will not be able to contribute to our 20/20/20 goals for renewable energy, reduced greenhouse gas emissions and increased energy efficiency.

In order to create competition and encourage efficiency, the future smart electricity market must allow a high degree of flexibility when it comes to the different actors and their tasks. Although many new roles on the market, such as commercial storage

providers and "prosumers" should be unregulated, **it is necessary to define a number of key responsibilities for the market actors.**[3]

A distinct separation between the responsibilities of the DSO and the supplier and other market actors such as ESCOs, aggregators, others will strengthen the customer focus on the European electricity markets, creating greater competition in the markets and better customer service as both parties strive to maintain a good relation with their customers.

The DSO handles all grid issues and provides information to other market actors while the supplier is the primary point of contact for the customer in non-grid related day-to-day matters. This ensures best service and greatest benefit for customers, because supplier and DSO can offer customer services for their core competencies and enhances customers' ability to participate in the market.

As different models for customer service are applied in Europe today, **GEODE** believes that each Member State should be allowed to choose which model suits their market best, taking into account local circumstances.

Before deciding about a change of the market model a thorough examination of consequences in combination with cost-benefit-analysis for every Member State is required. It is clear that a system change introduces additional costs. To contrast these costs with the expected benefits is the task of the CBA. Only if the benefits outweight the costs is a change advisable.

However, in the long term a framework on a market model or at least how different actors should interact should be defined to aid the creation of a single internal market.

STANDARDISED INTERFACES FOR COMMUNICATION OF INFORMATION/INTEROPERABILITY

There is a need to establish a **European standard for the local open interface in the new smart meters** to allow for data exchange among other market actors. This work is essential and **GEODE** supports the establishment of this standard by the Standardisation Coordination Group within Commission Task Force for Smart Grids.

Interoperability is crucial to ensure that all data captured by smart meters are readable and can be used efficiently by the DSO, the Supplier and other market actors, irrespective of who collects the data or who bills the customer.

[3] For more information see GEODE position paper on electricity market design. September 2012 (to be downloaded at www.geode-eu.org)

- To make the deployment of intelligent grids become a reality the following **barriers** have to be properly addressed:
  - Consumers acceptance
  - Incentives for R & D
  - Proper incentives for investments
  - Grid tariffs
  - Proper market design
  - Standardised interfaces for communication/interoperability
- It is the role of politicians and decision-makers at European, national, regional and local level to promote customer acceptance of smart meters.
- Funding on a national and European level is needed for R&D projects and must be made accessible to all network operators regardless of their size.
- The Smart Grid as well as the roll out of Smart Meters implies enormous investments for the DSOs.
- The DSO has to be allowed by the regulator to finance the investments through the grid tariffs or other revenue streams.
- The regulatory models have to be updated towards an investment and innovation friendly framework and DSOs tariff structures should be cost reflective.
- Incentives for both "conventional" and "smart" investments are needed.
  - "Conventional" components of the grid are and will be the backbone of the networks
  - Incentives for investments in innovation, such as large scale demonstration projects, are essential.
- Without proper incentives for DSOs, the Smart Grid will not take place.
- Current distribution grid tariff structure does not reflect the cost of the grid.
- DSOs should have more flexibility in designing the grid tariffs.
- A proper market design is needed for Smart Grids to contribute to reach 2020 goals.
- It is necessary to define a number of key responsibilities for the market actors.
- There is a need to establish a European standard for the local open interface in the new smart meters to allow for data exchange among other market actors.
- Interoperability is crucial to ensure that all data captured by smart meters are readable by the DSO, the Supplier and other market actors.

Intelligent Network challenges

DSOs face a huge challenge to make Smart Grids become reality. **GEODE** would like to highlight few issues of major concern for DSOs that could create significant risks for the well-functioning of the energy system in case they are not properly addressed.

MAINTAINING THE LINK BETWEEN DSO AND CUSTOMER

The DSO is the central point of contact for customers grid related issues such as connections, outage information, compensation from outages, power quality issues), in order to ensure good customer service. Therefore, it is important to maintain the link between the customer and the DSO.

It would add needless complexity to require that all suppliers entering the electricity market have sufficient knowledge to give the customer accurate information and customer service concerning grid issues, for example outages and power quality. This could also be a barrier to market entry for new suppliers.

MAINTAINING SYSTEM STABILITY

For security reasons it is essential that only the meter operator (DSO or other) have direct access to and control of the smart meters. With access from several parties there may be interference or discussion of responsibilities if something goes wrong i.e. disconnection of load or other interactions that may affect the customer.

The smart electricity market will demand a strong communication platform. This task has to be done in close cooperation with the DSOs and other market actors. Sharing communication channels with other parties has to be judge critical due to security of supply reasons.

See also picture of meter in chapter "Meter Data Management" for **GEODE** suggested way of enabling energy services to the customer.

DIFFERENT NEEDS IN DSO SYSTEMS COMPARED TO PUBLIC TELECOMMUNICATION SYSTEMS

Synergies between the DSOs and telecom industry are aligned on joint cable laying projects. These synergies are already realized today also with other grid or pipeline bound industries.

Nevertheless there are significant differences in performing DSO regulated duties ensuring reliability, availability, and high system security levels, compared with telecommunication normal market. The more Smart Grid functionalities are introduced in the grid, the higher level of system security that is needed. The solution is both encryption and dedicated (separated from public use) communication structures for energy system control.

Within the responsibility area of the DSO it has to be the decision of the DSO which communication solution fulfils their requirements best.

Therefore **GEODE** recommends a solution with a separated market for energy services, which should use open telecom services provided in competition to the customer. Using the solution with a standardized open interface from the meter, the customer himself can choose the level of service and communication.

When analysing cooperation telecom/electricity branch key differences between these markets have to be taken under consideration anyway:

- The telecom business model is bandwidth and low cost focused (competition)
- Requirements of utilities are reliability & availability focused with moderate/low bandwidth needs
- Utilities require long life cycles (investment efficiency), telecom's have shorter product/technology lifecycle (competition)

The expected increased data exchange between actors on the electricity market demands the highest data security levels necessary in order to operate a stable electricity grid. It is of utmost importance for the communication infrastructure for network operation to avoid unauthorised access of third parties and prevent cyber attacks. When operating electricity grids, high security levels are necessary to guarantee a secure and stable grid operation. The transmission of signals to open and close circuits or breakers at smart meters and collecting individual customer data are important examples of communication needs for a DSO. Both those activities are very sensitive where security risks must be avoided even at extra cost.

As a consequence, **there should be a closed dedicated communication infrastructure only for grid operation purposes.**

THE ISSUE OF DATA SECURITY AND PRIVACY

Data privacy and security is of critical importance. Smart Meters and information exchange model for disseminating the information collected from the meters must be secure and protect the privacy of final customers. Data security and privacy must be in compliance with relevant data protection and privacy legislation in the European Union and the Member States.

Customer is the sole owner of his information. The parties handling customer's data must ensure that only approved and authorised actors can access the information. This is especially important for the actors with a physical connection to the Smart Meter, in most Member States the DSO.

It is beneficial to give the responsibility of ensuring customer data security and privacy to the DSO, a central credible and regulated party that is the only one with the mandate to interact with the meter. This way the fulfilment of data security and privacy requirements can be guaranteed and supervised efficiently.

- GEODE identifies some challenges in bringing intelligence to the grids:
  - Keeping the link between DSO and the customer
  - Maintaining system stability
  - Different needs in DSO and telecom systems
  - Data security and data privacy
- The DSO is the central point of contact for customers grid related issues in order to ensure good customer service.
- For security reasons it is essential that only the meter operator (DSO or other) have direct access to and control of the smart meters. Sharing communication channels with other parties has to be judge critical due to security of supply reasons.
- There are significant differences in performing DSO regulated duties ensuring reliability, availability, and high system security levels, compared with telecommunication normal market.
- The more Smart Grid functionalities introduced in the grid, the higher level of system security is needed.
- There should be a close and dedicated communication lines for energy purposes.
- Data privacy and security is of key importance.
- It is beneficial to give the responsibility of ensuring customer data security and privacy to the DSO, a central credible and regulated party that is the only one with the mandate to interact with the meter.

Recommendations - Top 10 Actions

There are tangible actions that can and should be taken by the Commission and regulatory bodies for Smart Grids/ Smart Meters deployment to become a reality.

1.
European Commission, Members States and national regulators must promote customer acceptance of smart metering systems in order to realize the full benefits of Smart Grids.

2.
The DSO should retain responsibility for metering as the meter is the logical end point of the DSOs electrical grid (exception made in UK and Germany).

3.
DSO should play the role of the neutral regulated market facilitator.

4.
DSOs have to be incentivised to invest in innovative and intelligent technology, Smart Grids and Smart Meters as well as in conventional components of the grid. The DSOs, regardless of their size, need to be incentivised to engage in R & D activities connected with smart grid development.

5.
National Regulators have to empower DSOs to take an active part in developing Smart Grid solutions through cost reflective network tariffs structure and by allowing DSOs to offer more flexibility in designing the grid tariffs.

6.
Standardised open interface, interoperability and metering minimum functional requirements are essential and should be tackled in the Commissions standardization work.

7.
DSOs must without restriction be allowed to use information from the Smart Meters in order to fulfil their regulated duties such as system stability and billing.

8.
It should be the decision of DSOs which meter reading communication solution (e.g. for communication between the DSO and smart meter) is appropriate within their responsibility area.

9.
DSO is the central point of contact for customers in grid related issues and the link between DSOs and the customer should be maintained.

10.
European legislation should not prevent national solutions when necessary and cost effective.

Glossary - Abbreviations

Consumer - Encompasses households and small and medium-sized enterprises (SME) as well as the "prosumers"

Customer - Everyone connected to the grid

Prosumers - Electricity producing consumers

CBA - Cost-Benefit Analysis

DR - Demand Response

DSO - Distribution System Operator

LCNF - Low Carbon Networks Fund

R & D - Research & Development Projects

SME - Small and Medium-sized Enterprises

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